

49. The apparatus of claim 44, wherein the gas diffusing means comprises:
a gas supply line for receiving the reaction gases supplied via pipes installed outside the processing chamber; and
a porous plate forming the bottom of the gas diffusing means, for evenly distributing the reaction gases into the processing chamber, wherein the porous plate is in flow contact with the gas supply line. --

REMARKS

Reexamination and reconsideration of the present application are requested.

Applicants have amended claims 7, 11 and 38, canceled claim 42 without prejudice or disclaimer thereof, and added new claims 44-49. Accordingly, claims 7-11, 38-41, and 43-49 remain pending in the application.

35 U.S.C. § 102

The Office Action dated 20 December 2003 rejected claims 7, 11, 38 and 41 under 35 U.S.C. § 102 as allegedly being anticipated by Shinriki et al. U.S. patent 6,143,081 ("Shinriki"). Applicants believe that these claims as filed all define over Shinriki, but for clarification and to advance prosecution of this application, Applicants have amended claim 7 specifically to recite "means for annealing the wafer," and claim 38 to recite "a heater which anneals the wafer." Such features are disclosed, for example, on page 14, lines 7-10 of the specification.

No such features are disclosed by Shinriki.

The element 280 in Shinriki cited by the Office Action is not a “means for annealing the wafer” or “a heater which anneals the wafer,” but instead is a UV lamp installed outside the process chamber 204 and which merely serves to generate active oxygen atoms from ozone or N₂O gas (see col. 11, line 66 - col. 12, line 1; col. 12, lines 8-9). Shinriki clearly teaches that the wafer W is heated by the heating resistor 220 buried within the mounting table beneath the wafer (see, e.g. col. 13, lines 37-40; col. 14, lines 24-29).

Clearly, element 280 in Shinriki does not and cannot anneal any wafer.

The Office Action stated that: “*an apparatus is being claimed and the method limitations are not given patentable weight;*” and “*intended uses . . . do not further limit, and therefore do not patentably distinguish the claimed invention;*” and other similar statements (see, e.g., page 6, line 19; page 9, lines 15-19; page 11, lines 14-21).

~~Applicants wish to specifically address those statements at this time.~~

Applicants respectfully submit that the law is clear that:

“A patent applicant is free to recite features of an apparatus either structurally **or functionally**. . . . ‘There is nothing intrinsically wrong with [defining something by what it does rather than what it is] in drafting patent claims.’”

In re Schreiber, 128 F.3d 1473, 1478, 44 USPQ2d 1429, 1432 (Fed. Cir. 1997) (citing

In re Swinehart, 439 F.2d 210, 212, 169 USPQ 226, 228 (CCPA 1971)) (emphasis added).

Also:

“Product claims may be drafted to include process steps to wholly or partially define the claimed product”

In re Hallman, 655 F.2d 212, 215, 210 USPQ 609, 611 (CCPA 1981).

Therefore, Applicants respectfully submit that patentable weight must be afforded to the recited feature of claim 38, “a heater which anneals the wafer.”

Moreover, Applicants respectfully submit that 35 U.S.C. § 112, 6th paragraph specifically provides that:

“An element in a claim for a combination may be expressed as **a means or step for performing a specified function** without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.”

(emphasis added).

Accordingly, Applicants respectfully submit that claim language that recites an element in terms of a means for performing a function (intended use) to be provided

by the element is **absolutely** to be accorded patentable weight under 35 U.S.C. § 112, 6th paragraph.

Here, for example, claim 7 recites “means for annealing the wafer.” Applicants respectfully submit that it would be completely improper as a matter of law to fail to accord patentable weight to this claim language, in direct contravention of 35 U.S.C. § 112, 6th paragraph.

Therefore, Applicants respectfully submit that patentable weight must be afforded to the recited feature of claim 7, “means for annealing the wafer.”

Accordingly, Applicants respectfully submit that the apparatus of claims 7 and 38 are clearly patentable over Shinriki. Claim 11 dependent from claim 7, and claim 41, dependent from claim 38, is deemed similarly allowable.

35 U.S.C. § 103

~~The Office Action rejected: claims 7-8, 11, 38, 41 and 43 under 35 U.S.C. §~~
 103 as allegedly being unpatentable over Iida et al. U.S. Patent 5,527,417 (“Iida”) in view of Yin et al. U.S. patent 6,189,484 (“Yin”); claims 7, 11, 38 and 41 under 35 U.S.C. § 103 as allegedly being unpatentable over Iida in view of Shinriki; claims 9-10 under 35 U.S.C. § 103 as allegedly being unpatentable over Iida in view of Yin and further in view of Shang et al. U.S. Patent 6,189,484 (“Shang”); and claims 39-40 as allegedly being unpatentable over Iida in view of Shinriki and further in view of Collison et al. U.S. Patent 6,203,657. Applicants respectfully traverse these rejections for at least the following reasons.

Claims 7-8, 11, 38, 41 and 43 are patentable over Iida and Yin

Among other things, the apparatus of claim 7 includes “means for annealing the wafer,” and the apparatus of claim 38 includes “a heater which anneals the wafer.”

No such features are disclosed in Iida, Yin, or any combination thereof.

The element 102 in Iida cited by the Office Action is not a “means for annealing the wafer” or “a heater which anneals the wafer,” but instead is a UV lamp installed outside the process chamber 105 and which provide light rays for a photo-assisted CVD process (see, e.g., col. 8, line 66 - col.9, line 2). Iida clearly teaches that the target substrate 106 is heated by the heater 107 disposed beneath the wafer (see, e.g. col. 9, lines 4-5 and FIGs. 1 and 3).

The Office Action states that “Yin et al. discloses an apparatus with a heating element 170” (Office Action at page 4, lines 13-14). As Applicants pointed out in the amendment filed on 4 October 2002, Yin’s resistive heater 170 DOES INDEED serve to heat its anode electrode (col. 7, lines 56-64). Yin does NOT teach that element 170 heats the wafer, and it certainly does not anneal a wafer. The text in Yin at col. 6, lines 9-11, cited by the Examiner on page 10, lines 4-8 of the Office Action specifically states that “the pedestal base may contain wafer heating and/or cooling hardware.” This is NOT the “resistive heater 170.” Such a heater in the pedestal base cannot meet the limitation of claim 38 that the heater which anneals the wafer is disposed within an upper portion of the processing chamber above the susceptor, or the limitation of claim 7 that the means for annealing the wafer is installed at an upper portion of the processing chamber.

So clearly, like Iida, Yin also fails to disclose the recited “means for annealing the wafer” or “a heater which anneals the wafer.”

Therefore, Applicants respectfully submit that no possible combination of Iida and Yin could produce the apparatus of claims 7 and 38.

Also among other things, the apparatus of claim 7 includes a gas diffuser installed below the wafer annealing means, **for supplying reaction gases** into the process chamber, and claim 38 includes a gas diffuser installed within the processing chamber and adapted to supply reaction gases into the process chamber.

The Examiner has cited element 112 in Iida as allegedly corresponding to the recited gas diffuser.

However, Applicants respectfully submit that element 112 cannot correspond to the recited gas diffuser. Iida clearly teaches that the gas flow control plate 112 distributes a non-reactive **purge gas B** (e.g., N₂ gas) into the chamber to prevent attenuation of UV rays (see, e.g., col. 9; lines 11-14, 22-27, 42-45). In direct contrast to any diffusion, Iida teaches that the reaction (source) gas A is supplied from a nozzle 110a to flow directly in parallel across the target substrate (see, e.g., col. 9, lines 45-50).

That is, Iida teaches away from using element 112 to diffuse a reaction gas!

The latest Office Action states that “[s]ince an apparatus is being claimed as the instant invention, the method teachings are not considered to be the matter at hand . . . and therefore do not patentably distinguish the claimed invention” (Office Action at page 9, lines 15-19).

Applicants disagree. As explained above:

“A patent applicant is free to recite features of an apparatus either structurally **or functionally**. . . . ‘There is nothing intrinsically wrong with [defining something by what it does rather than what it is] in drafting patent claims.’”

In re Schreiber, 128 F.3d 1473, 1478, 44 USPQ2d 1429, 1432 (Fed. Cir. 1997) (citing In re Swinehart, 439 F.2d 210, 212, 169 USPQ 226, 228 (CCPA 1971)) (emphasis added).

Also:

“Product claims may be drafted to include process steps to wholly or partially define the claimed product”

In re Hallman, 655 F.2d 212, 215, 210 USPQ 609, 611 (CCPA 1981).

Therefore, Applicants respectfully submit that patentable weight must be afforded to the recited feature of claim 7, “a gas diffuser . . . **for supplying reaction gases** into the process chamber” (see also 35 U.S.C. § 112, 6th paragraph) and claim 38, a gas diffuser . . . adapted to supply reaction gases into the process chamber.”

Accordingly, for at least this additional reason, no combination of Iida and Yin could produce the apparatus of claims 7 and 38.

Furthermore, Applicants respectfully submit again that there is no motivation in the prior art to modify Iida to include a vertically movable susceptor.

The Examiner has stated that it would have been obvious to modify the apparatus of Iida to include the vertically movable susceptor allegedly disclosed in Yin because this allows for: (1) optimization of wafer exposure to plasma; (2) easy removability of the wafer from the processing chamber; and (3) better temperature control of the wafer.

Applicants respectfully disagree.

As to the first supposed motivation, Applicants submits that Iida does not expose any wafer to a plasma (in fact, it teaches away from this!). Iida clearly pertains to a “photo-assisted CVD method, unlike a plasma CVD method” (see, e.g., col. 1, lines 22-23). Accordingly, in Iida plasma is only applied to clean the process chamber (see, e.g., col. 2, lines 27-37; col. 29, lines 29-43; col. 31, lines 22-41), not to react with any wafer. And indeed, Iida discloses removal of the substrate from the chamber when the plasma is applied during the cleaning process (see, e.g., col. 14, lines 34-39 and compare FIG 46A with FIGs. 46B and 49). Without any plasma exposure to a wafer, how could there possibly be any motivation to modify Iida to provide “optimization of wafer exposure to plasma?”

In response to this, the latest Office Action now states that such optimization would occur “if it is desired by the operator to use the plasma for wafer processing.” Where is there any suggestion in the prior art for that? Note again that the whole point of Iida’s apparatus is to provide a photo-assisted CVD method, not a plasma

CVD method.

Applicants respectfully submit that such conjecture, without any suggestion or basis in the prior art reference whatsoever, cannot possibly provide a motivation under 35 U.S.C. § 103 to modify Iida such that it does not even operate as intended.

A purported rejection under 35 U.S.C. § 103 must be based on objective evidence of record, and cannot be supported merely on subjective belief and unknown authority. “The factual question of motivation is material to patentability, and could not be resolved on subjective belief and unknown authority.” In re Lee, 61 USPQ2d 1430, 1434 (2002) (“[T]he examiner can satisfy the burden of showing obviousness of the combination only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the teachings of the references”).

Applicants respectfully submit that no such objective evidence has been provided here.

So, Applicants respectfully submit that Iida does not even disclose that any wafer reacts with any plasma, and therefore there can be no possible motivation to modify the apparatus in Iida to “allow optimization of wafer exposure to plasma.”

As to the second supposed motivation, Applicants see nothing in Iida that suggests any difficulty in removing a wafer from the chamber that would motivate any such modification. Indeed, Iida is already provided with a means for removing the wafer from the chamber (see, e.g., col. 14, lines 34-39; col. 13, lines 32-34; col. 18, lines 24-25).

As to the third supposed motivation, Iida discloses an apparatus where a target substrate is heated by a heater 107/207/306/407/607/704/804 disposed **beneath** the substrate. Adding a vertically movable susceptor to such an apparatus where the wafer is heated from below absolutely would not in any way provide “better temperature control of the wafer.” Nowhere does Iida disclose that it intends or desires to heat a wafer from above, nor has any suggestion been disclosed **in the prior art** that would motivate one to modify Iida to do so. So, Applicants respectfully submit that there can be no possible motivation to modify the apparatus in Iida to add a vertically movable susceptor to provide “better temperature control of the wafer.”

In the latest Office Action, the Examiner now asserts that the vertical susceptor “will also allow for optimization of wafer exposure to the light in the apparatus of Iida et al.” (Office Action at page 10, lines 11-12). However, the Office Action fails to cite even a single sentence from the prior art that teaches that there is any need in Iida to optimize wafer exposure to the light, nor that such should be accomplished by providing the device with the vertical susceptor of Yin.

Again, a purported rejection under 35 U.S.C. § 103 must be based on objective evidence of record, and cannot be supported merely on subjective belief and unknown authority. “The factual question of motivation is material to patentability, and could not be resolved on subjective belief and unknown authority.” In re Lee, 61 USPQ2d 1430, 1434 (2002) (“[T]he examiner can satisfy the burden of showing obviousness of the combination **only** by showing some objective teaching in the prior art or that

knowledge generally available to one of ordinary skill in the art would lead that individual to combine the teachings of the references”).

Applicants respectfully submit that no such objective evidence has been provided here.

Accordingly, Applicants respectfully traverse the proposed combination of Iida and Yin.

For at least the foregoing reasons, Applicants respectfully submit that claims 7 and 38 are patentable over Iida and Yin.

Claims 8 and 11 dependent from claim 7, and claims 41 and 43, dependent from claim 38, are deemed similarly allowable.

Claims 7, 11, 38 and 41 are Patentable over Iida in view of Shinriki.

Among other things, the apparatus of claim 7 includes “means for annealing the wafer,” and the apparatus of claim 38 includes “a heater which anneals the wafer.”

As explained above, both Iida and Shinriki fail to disclose “means for annealing the wafer,” or “a heater which anneals the wafer.”

Therefore, for at least this reason, no combination of Iida and Shinriki could not possibly produce the apparatus of claims 7 and 38.

Furthermore, as explained above, Applicants respectfully submit that there is no motivation to modify Iida to include a vertically movable susceptor “to change the distance between the wafer and the active gas.” Indeed, the active gas in Iida is emitted across the top of the wafer from the side-mounted source gas feed nozzle. So there is no motivation disclosed in the prior art to modify Iida to add a vertically

movable susceptor.

In the latest Office Action, the Examiner now asserts that adding the vertical susceptor to Iida “will allow for adjustment of the heating of the front surface of the wafer by the lamps in the upper portion of the processing chamber.” (Office Action at page 11, lines 11-14). However, the Office Action fails to cite even a single sentence from the prior art that teaches that there is any need in Iida to adjust the heating of the front surface of the wafer by the lamps in the upper portion of the processing chamber, nor that such should be accomplished by providing the device with the vertical susceptor of Shinriki.

Indeed, as explained above, there is not even any teaching in Iida that it would even be desirable to heat the wafer at all by the lamps! The lamps 102 in Iida provide light rays for a photo-assisted CVD process (see, e.g., col. 8, line 66 - col.9, line 2). Iida clearly teaches that the target substrate 106 is heated by the heater 107 disposed ~~beneath the wafer (see, e.g. col. 9, lines 4-5 and FIGs. 1 and 3).~~

Again, a purported rejection under 35 U.S.C. § 103 must be based on objective evidence of record, and cannot be supported merely on subjective belief and unknown authority. “The factual question of motivation is material to patentability, and could not be resolved on subjective belief and unknown authority.” In re Lee, 61 USPQ2d 1430, 1434 (2002) (“[T]he examiner can satisfy the burden of showing obviousness of the combination only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the teachings of the references”).

Applicants respectfully submit that no such objective evidence has been provided here.

Accordingly, Applicants respectfully traverse the proposed combination of Iida and Shinriki.

For at least these reasons, Applicants respectfully submit that claims 7 and 38 are patentable over any combination of Iida and Shinriki. Claim 11 dependent from claim 7, and claim 41 dependent from claim 38, are deemed similarly allowable.

Claims 9 and 10 are patentable over Iida in view of Yin and further in view of Shang.

At the outset, Applicants respectfully submit that Shang does not remedy the shortcomings of Iida and Yin with respect to claim 7 as discussed above. Claims 9 and 10, dependent from claim 7, are deemed patentable for at least this reason.

Also, claim 9 includes a feature that the gas diffuser comprises a gas supply line for receiving the reaction gases supplied via pipes installed outside the process chamber. Claims 10 includes a feature wherein the pipes include a first pipe having a microwave guide for changing a gas mixture into a plasma state.

The Examiner has stated that it would have been obvious to modify the apparatus of Iida (as modified by Yin) to include the pipe structure of Shang.

However, Applicants respectfully submit that the Examiner's proposed motivation to modify the apparatus of Iida (as modified by Yin) to include the pipe structure of Shang is fatally flawed.

The Examiner has cited element 112 in Iida as allegedly corresponding to the

recited gas diffuser for supplying reaction gases into the process chamber. As explained above, element 112 cannot correspond to the recited gas diffuser for supplying reaction gases into the process chamber. Meanwhile, the gas dispensed from the gas flow control plate 112 in Iida is not a cleaning gas, and is not made into a plasma. Therefore, there could be no possible motivation to modify Iida to “result in the capability of cleaning the apparatus without causing the damage that sometime occurs when generating plasma in the processing chamber” as alleged by the Examiner.

In response to this, the latest Office Action states that “method limitations such as the type of gas being used are viewed as intended uses which do not further limit, and therefore do not patentably distinguish the claimed invention.

While disagreeing with that statement, Applicants respectfully submit that it is irrelevant to the issue at hand. The Examiner has cited element 112 in Iida as ~~allegedly corresponding to the recited gas diffuser.~~ **Regardless of what Applicants have claimed in claims 9 and 10, Iida teaches that the gas dispensed from the gas flow control plate 112 in Iida is not a cleaning gas,** and is not made into a plasma. Therefore, the proposed motivation to modify Iida - “so as to include the pipe structure of Shang et al. because this will result in the capability of cleaning the apparatus without causing the damage that sometimes occurs when generating plasma in the processing chamber” - makes no sense. Iida itself (not claims 9 or 10) teaches that the control plate 112 does not provide a cleaning gas in the first place, but instead provides an inert purge gas (see, col. 9, lines 11-14, 24-27, and 42-45).

Accordingly, the Examiner's statements about whether or not the "particular gas being transported through the pipes" in claims 9 and 10 carry patentable weight is completely irrelevant to Applicant's contention that there is no motivation to modify Iida to include the teachings of Shang et al.

Accordingly, Applicants respectfully traverse the proposed combination of Iida, Yin and Shang.

For at least these reasons, Applicants respectfully submit that claims 9 and 10 are patentable over any combination of Iida, Yin and Shang.

Claims 39-40

Applicants respectfully submit that Collison does not remedy the shortcomings of Iida and Shinriki with respect to claim 38 as discussed above. Claims 39 and 40, dependent from claim 38, are deemed patentable for at least this reason.

NEW CLAIMS 44-49

Applicants have added new claims 44-49. Among other things, the apparatus of claims 44-49 include a combination of a vertically movable susceptor installed at a lower portion of the processing chamber and adapted to support a wafer thereon, means for annealing a wafer, disposed within an upper portion of the processing chamber above the susceptor, and gas diffusing means for diffusing at least one process gas into the process chamber, installed within the processing chamber. No apparatus having such a combination of features is disclosed or suggested by any combination of cited prior art references.

CONCLUSION

In view of the foregoing explanations, Applicants respectfully request that the Examiner reconsider and reexamine the present application, allow claims 7-11, 38-41, and 43-49, and pass the application to issue. In the event that there are any outstanding matters remaining in the present application, the Examiner is invited to contact Kenneth D. Springer (Reg. No. 39,843) at (703) 715-0870 to discuss these matters.


If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 50-0238 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17, particularly extension of time fees.

Respectfully submitted,

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Date: 20 March 2003

By: _____


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Version with Markings to Show Changes Made**In the Claims:**

Claims 7, 11 and 38 have been amended as follows:

7. (Amended) A semiconductor manufacturing apparatus for use in removing an oxide layer, comprising:

a vertically movable susceptor installed at a lower portion of a processing chamber, for receiving a wafer thereon;

[a heater] means for annealing the wafer, said means being installed at an upper portion of the processing chamber; and

a gas diffuser installed below the [heater] wafer annealing means, for supplying reaction gases into the process chamber.

11. (Amended) The semiconductor manufacturing apparatus of claim 7, wherein the [heater] wafer annealing means is one of a lamp and a laser.

38. (Amended) A semiconductor manufacturing apparatus, comprising:
a vertically movable susceptor installed at a lower portion of a processing chamber and adapted to support a wafer thereon;

a heater which anneals the wafer, said heater being disposed within an upper portion of the processing chamber above the susceptor[and adapted to heat the wafer]; and

a gas diffuser installed within the processing chamber and adapted to supply reaction gases into the process chamber.

Claim 42 has been canceled.

Claims 44-49 have been added.